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SURGEON TO THE PATERSON EYE AND EAR INFIRMARY.

presented by the author

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PEROXIDE OF HYDROGEN AND ITS USE IN EAR DISEASES.

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Peroxide of hydrogen, H_2O_2 , as it is popularly called, is chemically and correctly the dioxide of hydrogen. It was discovered accidentally in the year 1818 by a French chemist, M. Thenard, but was little used either in manufacturing or in the arts until within the last decade. Pure anhydrous peroxide of hydrogen is a liquid of syrupy consistence, colorless, having an acid reaction, yielding four hundred and seventy-five times its own volume of oxygen on decomposition. The compound is very unstable, constantly on the slightest exposure undergoing decomposition and breaking up into its component parts nascent oxygen and water.

Bizett reports that the pure solution, anhydrous, readily destroys living tissues. Marchand writes "whatever will be the concentration of the peroxide of hydrogen, as long as it is made by the process which I employ in manufacturing the medicinal H_2O_2 it is always a harmless remedy, but it is unnecessary to make it more than fifteen volumes for medical purposes."

Peroxide of hydrogen (medicinal) is a three and one-fifth per cent. solution of the dioxide in pure water, from which all irritating or injurious proper-



ties have been removed; it yields about fifteen times its own volume of oxygen and is commonly called a fifteen volume solution.

In consequence of the instability of the compound, and to prevent its decomposition, the medicinal solution is slightly acidulated by the addition of minute quantities of hydrochloric and phosphoric acid.

It is slightly acid in reaction, colorless, almost tasteless and odorless, and will if tightly corked and not exposed to light, or a temperature higher than sixty or seventy degrees Fahrenheit, retain its properties for an indefinite period. It may be used in full strength, or if apparently irritating to the patient, it may be reduced to a one per cent. or stronger solution by the addition of distilled or carefully boiled water. It should be applied by glass or hard rubber applicators or sprays, as irritating and dangerous chemical combinations occur as a result of its contact with some metallic substances.

No solution should be used unless it is thoroughly reliable, fresh and free from injurious impurities; the ordinary commercial article is of no value for medicinal purposes, being irritating in its effect and unsatisfactory in the results obtained, in addition to holding in suspension poisonous chemicals.

A chemically pure fifteen volume solution is entirely harmless either for internal or external use, and in this possesses a decided advantage over any of the other drugs used for similar purposes, which approach it in efficacy as a destroyer of pus, bacteria or germs.

The solution, if in perfect condition, upon its application to any diseased surface of the skin or mucous membrane, immediately undergoes decomposition, the nascent oxygen which closely resembles ozone in its chemical effects, is thrown off and enters into affinity with the pus, bacteria or germs present, the pus is destroyed and the albumi-

noid matters of the secretion are coagulated, the germs and bacteria are annihilated. The nascent oxygen, which is the valuable constituent for cleansing, disinfecting and destroying germs, is in consequence of its instability rapidly converted into oxygen during the reaction. The chemical action of the solution if fresh occurs immediately upon its application and causes the formation of large quantities of white or yellowish colored froth.

The peroxide solution is much more active than any of the other remedies used for the destruction of microbes; the following table, which has been arranged after exhaustive experimentation, by Charles Marchand, the chemist, who manufactures the medicinal solution which is in most general use by medical men, is intended to illustrate the comparative efficacy of various chemicals, in the destruction of the microbes present in half a gram of diphtheritic membrane. The peroxide of hydrogen is claimed by this table to possess qualities as a destroyer of microbes not approached by any non-poisonous drug, and exceeding in efficacy most of the poisonous germicides.

The mixture or solution used contains like the peroxide solution three and one fifth per cent. of the active constituent.

The pus or blood corpuscles which come in contact with the hydrogen solution are immediately destroyed by the chemical action; it is not necessary to remove the resulting froth; it should be allowed to remain even when other applications are to be used, as it forms a protective for the exposed tissues and does not interfere in any way with the effect of any other desired medication. Glycozone, which it is claimed possesses qualities as a destroyer of germs greater than the peroxide of hydrogen itself, is recommended for use in the subsequent treatment of diseases, in conjunction with it. Glycozone is a preparation of chemically pure glycerine saturated with fifteen

times its own volume of ozone under pressure; it is quite different from the peroxide of hydrogen medicinal, and does not part with any of its ozone upon application to diseased tissues; it is intended for use in place of the many astringent or healing applications so much in vogue. It, as well as any application which the physician desires, may be used after the peroxide has been applied with better effect than if the wound was cleaned by ordinary methods, but no application should be made until the pus, etc., is entirely destroyed by the hydrogen solution.

QUANTITY OF THE MIXTURE OR SOLUTION REQUIRED TO ANNIHILATE MICROBES.

| | CUBIC CENTIMETRES. |
|---|--------------------|
| Glycozone (harmless) | 0 75 |
| Biniodide of mercury | 1 00 |
| Biniodide of silver | 1 33 |
| Marchand's peroxide of hydrogen, medicinal (harmless) | 2 00 |
| Bichloride of mercury | 3 00 |
| Nitrate of silver | 5 00 |
| Hypochlorite of lime | 9 00 |
| Chlorine gas (aqueous solution) | 10 00 |
| Iodine | 10 00 |
| Bromine | 24 00 |
| Iodoform (when fresh) | 28 00 |
| Salicylylic acid | 40 00 |
| Muriatic acid | 100 00 |
| Carbolic acid | 128 00 |
| Permanganate of potash | 140 00 |
| Chlorate of potash | 158 00 |
| Alum | 180 00 |
| Tannin | 190 00 |
| Common salt | 196 00 |
| Sulphide of calcium | 201 00 |
| Boracic acid | 300 00 |
| Sulphurous acid | 325 00 |
| Lactic acid | 360 00 |
| Chloride of iron | 371 00 |

The effect of peroxide of hydrogen upon suppurative diseases of the ear has been frequently demonstrated. The full strength fifteen volume solution may be used in nearly every case; infrequently it will

cause a moderate amount of pain, in which case the strength of the solution should be reduced by the addition of pure water.

The solution should be applied by syringing, dropping it, or carrying it into the ear on a cotton swab; the immediate effect is the production of a white or yellowish brown froth which will continue to form as long as there is any purulent or albuminoid matter for the drug to act upon. When no more gaseous emanations are present the ear will be found free from pus and perfectly clean.

The peroxide solution, it is claimed, has many advantages over any of the other germicides for cleaning deep cavities; its susceptibility to use in any quantity without danger of toxic effect; that the pathogenic bacteria of any species are totally and rapidly destroyed; the ability not only to destroy the products of decomposition and fermentation, but by the quality of effervescence during decomposition to carry forward and without the wound all such products, which it would be difficult to reach with ordinary solution by syringing or injection.

Any remedy may be used in the treatment of the disease subsequently to the application of the solution, the effect of the application itself being simply to render the parts perfectly aseptic and place them in a favorable condition to assist nature's reproductive process.

The application should be made every day, or at least every second day by the physician in charge of the case; the patient should be directed to drop five drops of the solution in the ear three times each day after thoroughly wiping out as much pus as can be easily removed; the glycozone or some of the other applications in general use should be applied immediately after the ear is thoroughly cleaned. In catarrhal otitis it is claimed that in addition to a specific effect on the catarrhal condition the peroxide

of hydrogen medicinal has proved of great use in soothing the mucous membrane and rarefying the air in the middle ear, the Politzer bag being used to inflate the tympanic cavity immediately after the application, thus forcing the solution into the middle ear in an effervescing condition.

The peroxide solution may be used advantageously in the treatment of mastoid disease after an incision has been made. The action of the remedy upon bone denuded of its periosteum, and even upon carious or necrotic bone, is unique; it causes a disintegration of the molecular particles and they are gradually subdivided and carried away in the frothy product of the chemical action, until a healthy surface appears upon which the solution seems to have only a beneficial effect. The action of the solution upon dead bone can be readily demonstrated by placing a small portion of necrotic bone in it; the bone will in a short time begin to disintegrate and continue to do so until it is entirely divided into very minute particles.

In some of the cases of mastoiditis treated, in which the denuded surface was very extensive, in from three to six weeks the bone would be in a perfectly healthy condition, the discharge of pus controlled, and the subsequent closing of the wound, when allowed, occurred rapidly and was perfectly satisfactory.

In one of the cases, in which for three years any attempt to allow the closing of the sinuses would be followed by an exacerbation of the inflammation, the carious condition was relieved and the opening allowed to close after two months of treatment.

The treatment is very simple and consists in syringing through the opening and into the meatus with a small glass syringe a sufficient quantity of the fifteen volume solution, at each sitting, to render the pus thoroughly aseptic, then packing the ear and the

wound lightly with strips of sheet lint or gauze thoroughly soaked in the same solution, great care being taken to allow the wound to close, although the packing must not be so introduced that it will prevent the free exit of any pus which may be formed during the interval between the dressings. The external incision should be made ample and if the packing does not prevent the opening from closing during the progress of the treatment it must be reopened with the knife. Glycozone has been suggested for use in keeping the wound open, being used instead of the peroxide in the dressing.

The result of this line of treatment which has been followed in a considerable number of mastoid cases, has indicated the possibility of a degree of conservatism in the treatment of mastoid disease which is very desirable.

All the cases treated have done well, no deaths have occurred and in no case was it considered necessary to scrape the bone or to remove any portion of it, while the period of time necessary for the wound to assume a sufficiently healthy condition to render it advisable to permit it to close, did not seem longer than the time which must ordinarily elapse after the operation for thoroughly scraping the mastoid, and was much shorter than the time required before the wound produced in chiseling the mastoid could possibly be allowed to close.

Special care should be taken to keep all the applicators or sprays, used either with the peroxide of hydrogen solution or glycozone, perfectly clean, especially in case of mixtures of glycerine and peroxide which should be made fresh every second or third day to prevent the possible formation of formic acid; only silver, hard rubber, glass or porcelain should be used for measuring purposes.

If care is taken to properly keep the solutions, they are perfectly harmless and calculated to be of inestimable benefit to all who use them.

